

Allegation of Scientific Misconduct in Galvanic Corrosion Study

Report to the U.S. EPA Scientific Integrity Review Panel

August 11, 2015

Introduction

The U.S. Environmental Protection Agency (EPA) is dedicated to preserving the integrity of the scientific and scholarly activities it conducts and that are conducted on its behalf. The EPA Scientific Integrity Policy, dated February 2012, provides principles and standards to ensure scientific integrity in the use, conduct, and communication of science. The Policy applies to EPA employees, contractors, and grantees. When this Policy is not adhered to, or is circumvented, the robustness of EPA science and the trust in the results of our scientific work can be impacted, causing a loss of scientific integrity. Loss of scientific integrity is the result of a deliberate action by an employee that compromises the conduct, production, or use of scientific and scholarly activities and assessments. EPA does not tolerate loss of integrity in the performance of scientific and scholarly activities or in the application of science in decision making.

Procedures for Resolving Allegations of a Loss of Scientific Integrity

Allegations of the loss of scientific or scholarly integrity are submitted to the EPA's Scientific Integrity Official (ScIO). Three criteria are considered when establishing a loss of integrity:

- 1) There is a significant departure from accepted practices of the relevant scientific or scholarly community;
- 2) The actions causing the loss of integrity are committed intentionally, knowingly or recklessly; and,
- 3) The allegation is proven by a preponderance of evidence.

If there is a reasonable basis to believe the allegation may have merit, a Scientific Integrity Review Panel, comprised of the ScIO, the relevant Deputy Scientific Integrity Official(s) (DScIO), and an impartial DScIO provide a review of the science and any other relevant information and reach a majority consensus.

Allegation

██████████, has alleged that EPA Region 3's contractors engaged in scientific misconduct in preparation of a research report entitled, "Effects of External Currents and Dissimilar Metal Contact on Corrosion from Lead Service Lines." The report was prepared by Dr. Steve Reiber, Formerly of HDR Engineering, and Laura Dufresne of The Cadmus Group, Inc., and finalized in November 2006. ██████████ has asked that EPA Region 3 either retract the 2006 study from the EPA Region 3 website or qualify the study's conclusions.

██████████ filed an EPA Office of Inspector General (OIG) Hotline complaint in March 2013. He sent an email with his concerns to the ScIO in August 2014. The ScIO told ██████████ that the OIG was investigating his allegations. In February 2015, the OIG found that the allegation did not rise to the level of criminal charges of scientific misconduct and referred the case to the ScIO.

Scientific Integrity Review Panel

A Scientific Integrity Review Panel (SIRP) comprised of Francesca Grifo, Ph.D. (the ScIO), John Forren (the DScIO for EPA Region 3), Robert Kavlock, Ph.D., (the DScIO for the Office of Research and Development), and Michael Shapiro, Ph.D. (the DScIO for the Office of Water) was convened to review the relevant information on the case.

Background

According to the National Association of Corrosion Engineers,

“Galvanic corrosion (also called 'dissimilar metal corrosion' or wrongly 'electrolysis') refers to corrosion damage induced when two dissimilar materials are coupled in a corrosive electrolyte. It occurs when two (or more) dissimilar metals are brought into electrical contact under water. When a galvanic couple forms, one of the metals in the couple becomes the anode and corrodes faster than it would all by itself, while the other becomes the cathode and corrodes slower than it would alone.”¹

In the present case, when a municipality replaces old lead service pipes with copper pipes (only up to the property boundary), the lead and copper pipes may be in contact. The lead pipe functions as the anode, the copper pipe as the cathode, and drinking water in the pipes functions as the electrolyte. Galvanic corrosion can occur, whereby the lead can dissolve. The concern is that, by replacing part of the lead pipe, the result may be an increase in lead in the drinking water, due to galvanic corrosion.

In July 2004, EPA Region 3 funded a study to determine whether galvanic corrosion was a significant contributing cause of the drinking water lead contamination in the District of Columbia. The report, titled, “Effects of External Currents and Dissimilar Metal Contact on Corrosion from Lead Service Lines,” was prepared by Dr. Steve Reiber, Formerly of HDR Engineering, and Laura Dufresne of The Cadmus Group, Inc., for George Rizzo, Work Assignment Manager, US EPA Region 3, and finalized in November 2006.² The report found that grounding and impressed currents moving along lead service lines have no meaningful impact on internal pipeline corrosion and do not likely contribute to metals release. The report also concluded that galvanic impacts can be substantial on unpassivated lead surfaces, but the magnitude of impact on aged and passivated lead surface lines is so minimal as to be inconsequential. Boyd et al. published a related article, with Dr. Reiber as a co-author, in the Journal of American Water Works Association (JAWWA) in March 2012³.

Analysis

For several years, [REDACTED] has expressed his concerns regarding the 2006 EPA report on galvanic corrosion and, in the last few years, regarding the related March 2012 JAWWA article by Boyd et al. [REDACTED] has taken his concerns to EPA Region 3, to the authors of the study and the article, to JAWWA, to the EPA Office of Inspector General (OIG), and to EPA's ScIO.

¹ <https://www.nace.org/Corrosion-Central/Corrosion-101/Galvanic-Corrosion/>

² http://www.epa.gov/dclead/Grounding_Effects_Study_Final_November_2006.pdf

³ <http://www.awwa.org/publications/journal-awwa/abstract/articleid/29961237.aspx>

██████████' concerns:

- He questions the scientific integrity of the 2006 report.
- He claims that he discovered that Dr. Reiber used fabricated graphs in his related article, published in the March 2012 edition of JAWWA.
- He alleges that the 2006 report has numerous false statements, fabricated figures, and that the report's conclusions run counter to established electrochemical principles and to published research.
- His lab devoted two person-years duplicating the studies done for the 2006 report. The results from ██████████' lab were consistent with electrochemical principles and other published research, but contradicted the results and conclusions of the 2006 report.
- He tried for years to obtain the study's data, the Quality Assurance Project Plan (QAPP), and the Quality Management Plan (QMP) for the contract from EPA Region 3 and from the authors. The data, QAPP, and QMP apparently are not available.

██████████ has asked that EPA Region 3 either retract the 2006 study from the EPA Region 3 website or qualify the study's conclusions.

Concerns about Related 2012 Article:

Dr. Reiber, the first author of the 2006 report, was also the second author on a related, peer-reviewed article published in March 2012 by Boyd et al.

In a March 12, 2013, email message to the ██████████, ██████████ stated,

I have also alleged that the first author of this report fabricated data appearing in a peer reviewed journal article on the same subject, and in that publication, cited data in the EPA RIII research report. Graphs appearing in the EPA RIII research report also appear to be highly irregular and are not representative of actual scientific data, and it is my suspicion that they are fabricated. Finally, key elements reported in a draft report, are directly contradicted in the final report.

In a December 16, 2013, email message for Dr. Grifo, ██████████ stated,

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According to ██████████, Boyd et al. did not use the same data for their 2012 article as Dr. Reiber used for the 2006 report. In an August 5, 2015, email message to Martha Otto, EPA/OSA, ██████████ stated,

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[REDACTED]

[REDACTED]

[REDACTED] has engaged in a public debate on whether JAWWA should retract the 2012 Boyd et al. article. [REDACTED] wrote an article in the December 2012 JAWWA, entitled, "Discussion: Effect of Changing Water Quality on Galvanic Coupling."⁴ He also wrote a letter to the JAWWA editors in January 2014.⁵ In both cases, Mr. Boyd responded. His responses included admissions of errors associated with the figures in the article. The JAWWA Board of Directors suggested that Mr. Boyd correct the errors in Figures 9 and 10 by way of the authors submitting an erratum for publication in Journal AWWA. The Scientific Integrity Program could not find that such an erratum has been published. Also, in his August 5, 2015, email message to Martha Otto, ORD/OSA, [REDACTED] stated that Boyd et al. never submitted an erratum.

G.S. Frankel, Fontana Corrosion Center, The Ohio State University, also wrote a letter to the JAWWA editor, in which he expressed concerns about the results and conclusions in the Boyd et al. article. According to Dr. Frankel, "These observations are directly counter to the well-understood principles underlying galvanic corrosion. There is no known science that can explain an increased galvanic effect for samples that are more separated in distance than for closer samples. The observations can only be explained by an unknown artifact or error in measurement."

To date, the JAWWA editors have declined to retract the Boyd et al. article. However, in January 2014, the JAWWA editors published an Expression of Concern⁶, in which they encourage caution by any readers accessing the article:

"Individuals accessing this article and related documents (all of which are listed below) are urged to use caution regarding its results. Questions raised subsequent to publication were not fully answered by the authors. *Journal* encourages readers to be attentive to future research that may provide more clarity on this topic."

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